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ORGANOPOLYSILOXANE COATINGS

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U.S. Cl. 260—37 9 Claims

ABSTRACT OF THE DISCLOSURE

The present invention relates to curable coating compositions comprising grafted organopolysiloxanes and inert fillers which may be applied to substrates as a surface coating. These coating compositions are particularly useful in areas of heavy traffic since they are resistant to abrasion and exhibit excellent adhesion properties.

This is a continuation of Ser. No. 631,129 filed Apr. 17, 1967, now abandoned.

This invention relates to coating compositions and more particularly to organopolysiloxane coating compositions.

Heretofore, it has been known that organopolysiloxanes make excellent high temperature coatings for various substrates, such as metal, wood and the like. It has also been known that these coatings are more resistant to corrosion than similar coatings made from organic materials. However, even though the organopolysiloxanes protect metal and glass surfaces from corrosion better in most cases than organic resins, they leave much to be desired in the way of protection for surfaces subjected to rigid conditions, such as those encountered in dimensional changes in the substrate caused by severe changes in the temperature. In addition, the organopolysiloxanes heretofore employed require higher curing temperatures and longer curing times than is required by the conventional organic resins.

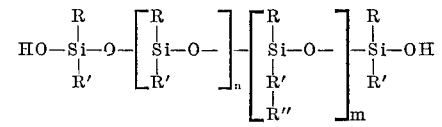
Furthermore, it has been known, prior to this application, that organopolysiloxane resins were substantially nonresistant to abrasion, particularly in areas subjected to heavy traffic.

Therefore, it is an object of this invention to provide an organopolysiloxane coating composition. Another object of this invention is to provide a flexible organopolysiloxane coating composition. Still another object of this invention is to provide a flexible coating composition which is resistant to abrasion. Still another object of this invention is to provide a coating composition which will adhere to substrates and withstand extreme and repeated changes in temperature without separating from the substrate. A further object of this invention is to provide a non-porous heat resistant coating composition. A still further object of this invention is to provide a method for adhering a grafted organopolysiloxane to a substrate.

The foregoing objects and others which will become apparent from the following description are accomplished in accordance with this invention, generally speaking, by providing an abrasion resistant coating composition containing a curable grafted organopolysiloxane and an inert filler.

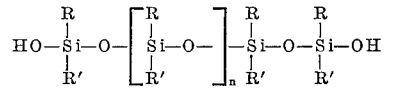
In other words, it has been found that inert fillers, such as organic and inorganic materials may be added to an organopolysiloxane containing terminal hydroxyl groups or in lieu thereof, terminal groups hydrolyzable by ambient moisture and having at least one polymeric group grafted to the organopolysiloxane to form a coating composition which is resistant to abrasion and at the same time will withstand extreme and repeated temperature changes without separating from the substrate.

The organopolysiloxanes contemplated in this invention may be represented by the following formula:



wherein R and R′ are organo groups which may be the same or different and contain from 1 to 18 carbon atoms, R″ is a monomeric or polymeric group grafted to the organic radicals represented by R or R′ above, n is an integer of from 10 to 1,000 and m is an integer of from 1 to 100.

The organopolysiloxanes which are combined with the monomeric compounds may be represented broadly by the formula:



wherein R and R′ are the same as those represented above and are selected from the group consisting of alkyl, cycloalkyl, aryl, alkoxy, cyclo-alkoxy and aryloxy groups and n is the same as shown in the formula above. Of the different organopolysiloxanes, the alkyl polysiloxanes are preferred, particularly the lower alkyl polysiloxanes and more preferably the methylpolysiloxanes.

Grafting of the monomeric or polymeric groups to the organopolysiloxanes is expeditiously carried out by using a free-radical initiator, normally a peroxide. As little as 0.05 percent of the more active peroxide initiators based on the weight of the reactants is adequate in most cases. Where increased reaction rates are desired, as much as 2 percent or even more of the initiator may be used. In general, it is advisable not to exceed about 1.0 percent since higher concentrations tend to promote coupling reactions, which understandably increase the viscosity of the reaction mixture.

In using a free-radical initiator, the reaction, when carried out in a batch-wise process, generally proceeds at a satisfactory rate if the temperature is maintained in the area of about 60° C. to about 130° C. If a continuous process is used or if the reaction is carried out batch-wise without a free-radical initiator, substantially higher temperatures such as, up to about 160° C. may be advantageously employed.

The most suitable peroxide initiators are those in which at least one of the peroxide oxygens is attached to a tertiary-carbon atom. Exemplary of these initiators are: dialkyl peroxides such as di-tertiary-butyl and dicumyl peroxide; hydroperoxides such as tertiary-butyl hydroperoxide, cumyl hydroperoxide and decylene hydroperoxide; cyclic peroxides such as ascaridole and 1,5-dimethyl-hexane-1,5-peroxide; and peresters such as tertiary-butyl perbenzoate, tertiary-butyl peroxyiso-propylcarbonate and tertiary-butyl peroctoate. Ketone peroxides such as acetone peroxide and cyclo-hexanone peroxide are also applicable.

Acyl peroxides and peracids may be used in the practice of the invention, but in general they result in less grafting, i.e., lower yields of the grafted product. The difference is believed to lie in the nature of the radicals produced, thus tertiary-alkoxy radicals from di-tertiary-butyl peroxide, for example, have a strong tendency to extract hydrogen atoms which is a necessary step in the grafting procedure. On the other hand, acyloxy radicals produced from acyl peroxide, e.g., benzoyl peroxide, while effective initiators are relatively ineffective as hydrogen extractors.

Although it may be possible to carry out the grafting procedure using organopolysiloxane material free of ter-